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TREE PROGRAMS IN URBAN AREAS

A THESIS

Presented to

The Faculty of the Graduate Division

by

Newton C. Davis

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SUMMARY

The purpose of this study is to determine the basis for the establishment of municipal tree programs, to analyze and evaluate these, and to recommend an economical and practical approach to the establishment and implementation of such programs.

Municipal tree programs, found in only a few American cities at the present time, are systematic programs for the planting and maintenance of trees located on highway rights-of-way and other public areas and providing for the control of private trees.

The proper use of trees in cities will result in the capture of tree benefits and the elimination of problems trees present. This study points out the aesthetic, economic and functional benefits to be derived from the proper use of trees along with the problems which result from their improper use.

In determining the recommended approach to the establishment of a comprehensive municipal tree program, an analysis is made of the approaches of various cities to tree program initiation, policy formulation and program implementation. The analysis reveals that the most successful municipal tree programs provide that a city official administer the program, a city agency, in most cases an existing one, perform all planting and maintenance of street and other public trees according to an official tree plan and at city expense. The best programs also provide for the regulation of trees on private property.

Therefore, in order to obtain the maximum benefits and alleviate the problems deriving from trees, the main recommendation of this study is the adoption of a comprehensive tree program under the direction of a city official and carried out by a municipal agency.

CHAPTER I

INTRODUCTION

Trees may be assets or liabilities to cities and property owners. This chapter will consider the value of urban trees and the problems trees present. It will show how proper planning will make it possible to capitalize upon the values and minimize the problems.

Value of Trees to Urban Areas

The value of trees to urban areas is great. Among the most important functions of city trees are protecting and enhancing property values, controlling erosion, moderating climatic extremes, providing screens and buffers, promoting traffic safety and contributing to community beautification.

Protecting and Enhancing Property Values

Trees protect and enhance property values. Roadside trees and trees on private property increase the value of adjacent properties. According to the Highway Research Board of the United States Bureau of Public Roads, street and highway trees benefit adjacent land values by improving appearance and screening traffic noises and unsightly views. The Board states: "Shade trees enhance property values, and a tree on the right of way may be as great an asset as a tree on private property."[1] Studies have shown that trees on private property improve the economic value of individual lots[2] and neighborhoods as a whole.[3]

A common complaint about large new subdivisions is that they are often left barren of trees. Existing healthy and well located trees, if preserved, serve as future assets. Trees increase the value of lots by making a new subdivision more attractive from the beginning. Still, many developers clear the land of trees before construction is begun, basing this practice on the idea that building on land that is completely cleared of all existing trees is more economical than building on wooded land, since trees get in the way during construction. However, it has now been shown that developers may build economically on wooded land by selective clearing, even for lower priced housing. John Mathews, a City Council member in North Little Rock, Arkansas, has pointed out that "the best trees can be avoided in locating streets, houses and driveways." He says further: "While it is a little cheaper to build on treeless land, selling even low-cost houses is much easier with plenty of trees to stop prospective buyers' eyes from sweeping endless distances. Being able to see several blocks at a glance gives any new development that depressing mass housing project look."[4] According to the Community Builders Handbook, the cost of locating trees on base maps and marking trees for protection is repaid many times over by the value added to each house, the cost of locating the trees on the topographical map being minor, as is any additional cost in the clearing operations.[5]

Many reputable developers, convinced that trees add to the value of houses in their subdivisions, now follow the practice of preserving existing trees. Estimates of the value trees add range from

$200 to $800 per house.[6] One developer, who builds on wooded land if possible, has established a company nursery for tree planting when he builds on non-wooded land.[7] An Atlanta, Georgia, subdivider never develops land that is not 60 to 80 per cent wooded. He designs streets and grades so as to preserve as many wooded areas and single trees as possible.[8] An Atlanta member of the American Society of Appraisers says that lots with trees are appraised for substantially more than are lots without trees. In addition, he says, tree preservation adds to the resale potential of houses.[9]

The economic value of trees applies to commercial and industrial, as well as residential, areas of cities. This is being realized by more and more businessmen. In seven years, 40 firms spent $200,000 planting 296 trees in a downtown section of Los Angeles. The Richfield Oil Corporation was the most active participant in this program. Representatives of this company consider the high costs of street tree planting to be a good investment in that the trees around the building serve as a good advertisement.[10] Mr. John Shirley Ward, the President of Los Angeles Downtown Business Men's Association, says: "More and more trees are being planted downtown. The community benefits aesthetically, and firms which plant trees are finding that definite economic benefits result."[11]

The contribution of trees to property values is pointed out in a publication of the Los Angeles County Regional Planning Commission, which maintains that landscaping, including the planting of trees, "is

not only desirable but necessary to minimize the creeping blight so often associated with commercial and industrial uses in older urban areas."[12]

Controlling Erosion

One of the problems faced by planners and engineers in urban areas is that of preventing rapid rainfall runoff and, consequently, erosion as well as the lowering of water tables. The Supervising Landscape Architect for the United States Bureau of Public Roads, Mr. George B. Gordon, has expressed concern over erosion near grade separations on controlled access highways in urban and suburban areas. He says, "Before highway construction many of these areas were covered by woodland while they are now covered by paving and houses. Increased surface runoff resulting from change in land use has resulted in heavy erosion damage to stream channels and highway gutters."[13]

According to Gil Morris of the Building Department of the City of Los Angeles, two-thirds of all Los Angeles homes are being built on hillside lots and all these are potential land slide victims. Trees are generally absent in this area; those that do exist may be cut and apathy exists regarding new plantings. Several California homes have been severely damaged or destroyed by slides.[14]

According to Mr. Louie F. Deaton, Unit Forester for the Atlanta and Fulton County (Georgia) district, trees play an important role in reducing rainfall runoff in urban, as well as rural, areas. Mr. Deaton says that, especially in residential areas, where the greatest number of trees are normally found, trees reduce the amount of rainfall runoff

and thereby aid in preventing erosion, storm damage problems, siltation of streams and reservoirs and slides and aid in reducing flash flood damage. Trees aid in preventing rapid runoff primarily because of the great degree of percolation which takes place underneath and near groups of trees or even single trees. Trees are more effective in preventing rapid runoff than are ground covers such as grass or ivy because a tree's root system extends to far greater depths than does the root system of grasses. Decaying roots result in biologic activity and more porous and permeable soil at considerable depths beneath the ground surface. Trees are very effective in preventing slides in that they stabilize the terrain through the ability of the roots to bind the bedrock to the layers of soil.[15]

Residents of a "doorstep," treeless subdivision in San Francisco began an organized program of planting rapidly growing trees on the slopes to offset erosion damage. Five years later, erosion damage was substantially reduced.[16]

Moderating Climatic Extremes

Another value of trees in urban areas is that they aid in moderating climatic extremes. Wholesale tree removal in old and new sections of cities can result in adverse changes in climate in the immediate area.[17] Although large, rural forests are the result (rather than the cause) of climate, single trees and wooded areas do materially affect the climate of the immediate locality they occupy. That effect is due to the crowns of the trees which enclose the land much as roof and walls enclose a house. According to the U. S. Department of

Agriculture, areas underneath and near trees are both cooler in summer and warmer in winter than are open places. The same holds true of daily extremes.[18]

Air which circulates through trees is more moist than air which does not, because the force of the wind is broken and less evaporation occurs. Trees take in carbon dioxide and release oxygen into the air, making the air more pleasant and comfortable to humans. Through the process of transpiration, trees give off water which increases humidity. Smoke and dust settle on the leaf areas of trees where they remain until washed away by rain.[19]

Trees break the force of high winds, sleet and rain, which is beneficial to both pedestrians and buildings. According to studies conducted by the United States Department of Agriculture, wind velocity near a row of trees with thick foliage may be reduced as much as 30 per cent. Wind velocity through a row of trees with thin foliage is about 66 per cent of normal velocity.[20] Walls and solid fences about a building often produce swirling eddies, rather than serving as windbreaks.[21] The value of trees as windbreaks is greater in outer, less densely developed, portions of cities where cold winds prevail. One such city is Kitimat, British Columbia, a new town in a cold, windy locale where trees are extensively used as windbreaks.[22]

The planting on the property of the Bell Laboratories at Murray Hill, New Jersey, serves as a good example of the use of trees for climatic moderation. The dust problem is also largely reduced by the trees which also serve to provide windbreaks and shade.[23]

Providing Screens and Buffers

Still another value of trees in urban areas is that they may be used as visual screens and sound buffers. Trees are effective in screening parking lots and unsightly views and serving as visual screens and noise buffers between residential and commercial areas. As sound barriers, trees may be planted between major thoroughfares and residential areas. The Parkway and Landscape Engineer for the New Jersey State Highway Department, Mr. Oliver A. Deakin, says: "In urban areas we do a considerable amount of planting of large growing shade trees, pines and smaller flowering trees for the purpose of reducing traffic noise, dust and fumes."[24]

Urban area landscaping policies for the Interstate Highway System take into account these uses of trees. On the System, trees are used for the screening of traffic sights and noises from residential zones and the screening of unsightly views.[25]

Promoting Traffic Safety

Trees are also valuable in promoting traffic safety. This has been recognized by the Highway Research Board, which recommends the planting of trees to prevent headlight glare, to aid in traffic guidance, to accent the presence of highway structures and traffic hazards and to frame directional signs.[26]

Contributing to Community Beautification

One of the most obvious values of trees is community beautification. By relieving the city dweller of the harsh lines of steel and

concrete, trees serve as a pleasure break in the urban environment. One city which has been particularly successful in improving its appearance is Syracuse, New York, which won the New York State Fair prize for community beautification in 1961, largely because of its tree planting program.

In Stockton, California, trees were being removed in older sections of the city because of street widening and changing land use. City officials and civic organizations, seeing the trees disappear, then realized how valuable the trees were in beautifying the city, and took action to reverse the trend of creeping treelessness.[27] In cities where there is no natural tree growth or very little, there is normally more consciousness of the contribution of trees to community beautification. Pittsburg, California, is an example of a city without much natural tree growth, which has undertaken a tree planting program primarily to improve community appearance.[28] With proper planning, trees may help solve urban problems by enhancing property values, aiding in erosion prevention and climatic moderation, serving as screens and buffers, aiding in traffic safety and contributing to community beautification. Without careful planning they may also create problems.

Tree Maintenance Problems in Urban Areas

Most urban tree problems result from the use of unsuitable species of trees and the improper location of trees. Expanding tree roots have lifted sidewalks, cracked curbing and clogged drains. One

city of 190,000 people, Sacramento, California, recently spent $30,000 in one year to repair damage trees had done to sidewalks.[29] Tree branches may become entangled with utility wires and interfere with street lighting. Street trees and trees on private property often hamper intersection traffic visibility.

Falling limbs from trees susceptible to easy breakage are hazards to traffic and pedestrian safety. The presence of trees that break easily not only presents a safety hazard but may also prove costly. One small city, Livingston, California, recently had to remove 65 such trees at high cost to both the city and property owners.[30] Another California city, San Bernardino, once lost 140 trees in a wind storm. These trees, planted for expediency, were too brittle to withstand the severe wind currents that often move quickly through city streets.[31]

Disease is another problem. Due to the existence of diseased trees or trees susceptible to disease, many cities face excessive maintenance costs for treating or removing these trees. One-half of New York City's 1,000,000 trees require special disease control treatment.[32] Peoria, Illinois, a city of 103,000 people and 15,000 trees, has removed over 1,000 diseased trees since 1957 at a cost exceeding $80,000.[33]

Tree Programs for Urban Areas

Many U. S. cities have been, or are, faced with the tree problems mentioned above, but since Lansing, Michigan, was faced with

practically all of them, its efforts to solve these problems deserve mention. Officials in Lansing at first thought the simple solution was to remove or simply prune the trees by lopping off roots and branches of those trees which were causing trouble. However, these practices merely resulted in many dead stumps, recurring pruning problems and disfigured trees. After it became obvious that a carefully planned tree program was needed, the city planned and launched a complete program of tree planting, maintenance and removal-replacement. Fifteen years after Lansing initiated its tree program, tree problems, including the high maintenance costs to the city, to property owners and to utility companies, were considerably reduced.[34]

Careful planning is necessary not only to deal with tree problems but also to enable maximum realization of tree values. Manhattan, Kansas, serves as a good example of a city that has capitalized on tree values. While some of the city's trees were presenting problems, large new residential areas had developed with very few trees. City officials, realizing the need for trees, undertook careful planning for a program to establish trees where they were needed. Legislation was then passed to insure proper tree protection, planting, maintenance and removal and the tree program was under way. Ten years later the program was termed a success and is continuing today. The City Manager has stated:

> In analyzing the results of the tree program, several facts are of significance. A unified program for the conservation and development of street trees has been developed. Adequate, effective, and prompt care of trees is being administered.

> Street trees in all sections of the city conform to standards of clearance, shape, spacing and receive equal and adequate attention.[35]

Tree programs, such as those undertaken by Lansing and Manhattan, are necessary to overcome tree problems and realize tree values. However, the great majority of U. S. cities do not have authorized tree programs providing for the control of tree selection and location on streets and other public areas and for proper regulation of trees on private property. As a result safety hazards, space or use conflicts and unnecessary maintenance costs continue. In addition, the city and its citizens are deprived of the value of trees.

Tree programs are a concern of the city planner since they aid in achieving some of the planner's basic goals: the enhancement of property values and civic liveability; civic beautification; and the reduction of hazards, land-use conflicts and maintenance costs. Many others are concerned also. Local governments and property owners are interested in property values and civic beautification. Engineers and public works officials deal with erosion problems, traffic and pedestrian safety, use conflicts involving trees and overhead and underground utilities, and the problem of tree removal for street widening. Public Works and Parks Departments, along with utility companies, are interested in reducing extra work and added maintenance costs accruing from the removal, excessive pruning or disease treatment of undesirable trees. In considering a tree program, it is the responsibility of the planner to focus all of these interests on a common and workable goal.

Thesis Objective

The objective of this thesis is to determine an economical and practical approach to the establishment and implementation of urban tree programs. Recommended tree programs will provide for the capture of maximum tree benefits and for the elimination of tree problems through systematic tree planting, maintenance and removal based on appropriate planning, legislation and administration.

Chapter II will deal with tree programs related to trees on lands and rights of way. Chapter III will deal with the regulation of trees on private property.

In the development of the thesis, existing tree programs and tree control regulations of cities throughout the United States will be reviewed and analyzed.

CHAPTER II

MUNICIPAL TREE PROGRAMS

Municipal tree programs are systematic programs for the planting, maintenance and removal of trees located on (and, in some cases, overhanging) public highway rights-of-way, parks and public building sites. Such tree programs normally extend to properties owned by county, state and federal agencies. (These agencies normally assent, since they benefit from the services provided by the municipality, even though the city may charge for these services.) While tree programs include tree planting, maintenance and removal on public areas other than rights-of-way, the programs are commonly referred to as "Street Tree Programs". This chapter will discuss municipal tree programs from their initial stages through their implementation.

Beginning a Tree Program

A city usually begins a tree program as the result of a demand from either private citizens or public officials who recognize the advantages of systematic planning and control of trees in streets and other public areas. If the city administrator is convinced of the desirability of such a program he must decide which official and department will plan and administer it.

Selecting the Administrator and Operating Agency

Most cities having a tree program give the job of carrying it

out to one of the existing city departments, but there are other alternatives which also merit consideration. The various alternatives will be presented in the sections that follow.

Assignment to an Existing Department or Division. The principal factors in determining which department should be given the job of carrying out the program are the experience in street tree work of the personnel and department head, their ability to devote the time required for the program and their equipment. The existing department selected to administer a tree program will normally be either the one in charge of parks or the one in charge of public works. In Stockton, California, regular Park Department crews administer the tree program, with the department head serving as the program's administrator.[36] In El Paso de Robles, California, Public Works Department crews perform the work and this department's Superintendent is the program administrator.[37] This is one of the most effective approaches, especially if, as in the case of El Paso de Robles, the public works department has the responsibility for everything within public rights-of-way. The street department is another which is sometimes given responsibility for the tree program. This is the case in Selma, California,[38] and in East Lansing, Michigan,[39] where Street Department crews carry out the tree program, with the Street Commissioner serving as administrator.

If the city has a city forester and forestry department or a forestry division of the park department, this department or division would logically be the one to carry out the tree program. If there is a separate forestry department, the city forester would become the

program's administrator.[40] If the forestry division is within the park department, the park superintendent would be the administrator, with the city forester his authorized representative.[41]

Assignment to a New Division Within an Existing Department. While assigning responsibility for a tree program to an existing department or division is the most common procedure, consideration should also be given to establishing a new division within an existing city department. This is especially true if the city performs all tree work, prohibiting property owners from planting, maintaining, or removing trees (except in unusual cases) rather than permitting or requiring property owner maintenance of street trees, and if the regular park and public works department crews do not have the time to perform year-round tree work. In many cities, a special division is created in the park or public works department. This may be a street tree division or, if no forestry division already exists, a forestry division, with its supervisor acting as duly authorized representative of the department's superintendent, who is officially the program's administrator. In Modesto,[42] and San Diego, California,[43] a Street Tree Division within the Park Department carries out the tree program. Fresno, California, has a Forestry Division in the Park Department. The City Forester heads the Division, yet the Park Superintendent serves as the administrator of the tree program. The Street Tree Divisions in San Diego and Modesto, and the Forestry Division in Fresno, plant, maintain, and remove trees on all public areas—parks and public building sites as well as streets—within the city.

Assignment to a New Department or Official. A separate, independent department or official sometimes administers a tree program. A Tree Department, headed by a City Forester, carries out the tree program in Manhattan, Kansas.[44] In Escanaba, Michigan, where the tree program is carried out primarily by citizens, a City Forester, responsible to the City Manager, is in charge of the tree program, performing major tree maintenance tasks while requiring property owners to perform routine maintenance work on, and some removals of, trees.[45]

Assignment to an Individual Board or Commission. A third possibility for tree program administration, less frequently used, is the establishment of an independent board or commission. Several New Jersey municipalities, in which there are no Parks Departments, have established a Shade Tree Commission which is responsible for the administration of the tree program. This Commission, unsalaried, has three members who are appointed by the mayor. The Commission is authorized to purchase equipment and hire additional personnel needed to operate the program.[46] In Kent, Ohio, the street tree program is administered, in cooperation with the Department of Public Service, by a Shade Tree Commission, composed of three property owners.[47]

In any case, a city agency should carry out the program rather than contracting for tree work. This agency should be given the responsibility for the street tree program and the care of trees on all public property in the city. Iowa City, Iowa, where the tree program is carried out by a tree crew of the Parks Department, estimates an

annual savings of $23,000 as compared with the probable cost of contracting for its tree work.[48] Having the work done by the city will also assure that the work will be performed in accordance with city standards.

Cooperation with City Departments

Regardless of which agency is designated to administer the program, cooperation with various city departments will be necessary, especially when their work directly affects public trees. The tree program administrator should pass upon all building permits that may cause injury to public trees or their removal. All sewer, lighting, water, and paving plans should be cleared with him. The administrator should consult with the city lighting engineer (or his equivalent), and vice versa, in developing a system of tree trimming to give full effectiveness to the street lighting system.

Cooperation with city departments is practiced in many cities. In Pasadena, California, the city makes advance provision for replacements when street widening requires the removal of street trees. In planning a widened street, the City Engineering Department allows space for new trees, which then are installed by the Park Department.[49] In Modesto, California, the Public Works Department is required to notify the Park Department (which is responsible for the tree program) of any applications for new curb, gutter, sidewalk or driveway installation, or other improvements which may cause the removal of, or injury to, any street tree, or which may interfere with the fulfillment of the city's official tree plan.[50]

Advisory Boards

Some cities have established an advisory body to consult with the tree program's administrator as the program progresses. This may be a Shade Tree Committee[51] or Street Tree Board,[52] consisting of a number of property owners. It is desirable that one of the number be an authority on urban trees. The director of the city planning program and administrator of the tree program should serve as ex-officio members. (The specific functions of this body are discussed under Official Tree List and Official Tree Plan.)

The Formulation of Policy

As soon as the program has an administrator, he should make recommendations as to the policy the city will follow in the administration of its tree program.

Existing Tree Survey as a Basis for Policy Formulation

In order to have concrete information on which to base subsequent policy decisions, the designated administrator should undertake an existing tree survey as soon as possible. This survey is an inventory of all existing city street trees. The survey will help in determining the character and initial costs of a desirable tree program (which in turn will affect the final decision as to the extent of city participation and control.) The inventory will disclose the number of trees requiring removal, pruning or spraying, along with the number of trees to be planted and the areas where most planting is needed. Obviously, if a city is over-planted with undesirable trees, a long-

range removal and replacement program would be in order while, if a majority of the existing trees are desirable, emphasis would be placed on their care and preservation. If large numbers of trees are in good condition, present few problems, and are presently unaffected, yet are susceptible to disease, then major emphasis would be placed upon spraying and other methods of disease treatment.

Collection of Field Data. The first phase of the survey is the collection of field data. This is a formidable task and the city may lack the personnel to carry it out. However, garden clubs, civic organizations, Boy or Girl Scouts, Camp Fire Girls or high school botany classes are normally eager to participate in the field survey. With proper instruction and supervision they can perform acceptably. Field data to be recorded on small block maps and data sheets (See Appendix A) should consist of the following:

1. The location, type, condition, shape, general spread and present size (diameter, four and one-half feet above the ground) of each tree and the location of all stumps.
2. Site factors, including height of overhead wires and overhead cables; width of planting strip; the location of driveways, poles and signs; type and width of street; type of adjacent land use; average building setback on each block; whether there are few or many trees on private property; topography; soil conditions; and drainage.

3. Special conditions such as trees that are damaging curbs or sidewalks, growing into overhead lines, obscuring traffic signs or vision, obscuring street lights, interfering with vehicular or pedestrian traffic or are messy, dropping litter or fruit.

Classification of Trees. After the field survey is completed, a city-wide map showing the location of each tree, using codes to indicate its classification should be prepared.

Each tree should be classified and marked on the map as one of the following:

1. "General maintenance."
2. "Early removal."
3. "Progressive removal."

"General maintenance" trees are those which are in good condition and present no problems other than the need for regular maintenance.

"Early removal" trees are those that are creating immediate and serious problems. The following conditions, in combination or singly, would warrant such a classification:

1. Poor condition, dead, or highly susceptible to disease.
2. Interference with overhead utilities. (In many cases these should not simply be trimmed because the problem will merely recur.)
3. Interference, past or present, with underground utilities or sidewalks.

4. Location within six feet of water or gas laterals.
5. Not full-grown and located so that sidewalk construction or street widening will eventually force removal.
6. Creation of safety hazards.

"Progressive removal" trees are those which, because of their root system, might interfere with sidewalks or underground utilities; those which might interfere with overhead wires or street lamps; those of a short-lived variety; those which are not in conformity with other trees or the immediate surroundings; those which are messy or whose leaves clog sewers or drains; those with easily damaged bark; those whose overly dense shade prohibit grass growth; and full-grown trees whose ultimate removal is definite because of a land use change or planned street widening or sidewalk construction. Also, if several desirable trees are overcrowded, some of them should be classified as "Progressive removal." Routine maintenance should be recommended for "Progressive removal" trees until they are actually removed.

If large numbers of a certain species are in good condition, present few problems, yet are susceptible to disease but show none of its symptoms, the category "Spraying" might be added and these trees may be recommended for other general maintenance. In carrying out its tree survey, Iowa City, Iowa, found that the majority of its trees were of a species that had been wiped out by disease in nearby cities, yet the city's trees showed no indications of disease attack. Therefore, these trees were marked for spraying.[53]

Determining the Extent of Municipal Control and Participation

Even before reaching a decision as to the administrator and operating department, the city administrator may have given some consideration to the extent of city participation and control in the tree program. The final decision should be made after the designated administrator, on the basis of the existing tree survey and other considerations, has made his recommendations.

Complete control of all tree planting, maintenance and removal in all public areas is normally exercised by the city in a municipal tree program. This is to insure uniformity for the sake of appearance and maintenance. The amount of city participation in the performance of tree work, or in financing the work, however, varies from city to city.

The city may perform all planting, maintenance and removal of street trees, prohibiting the property owner from anything but watering trees, as is done in Modesto, California;[54] or, the city may permit property owners to plant trees with city regulation of the type and location of species planted, as is the case in Selma, California.[55] Under the latter practice, the property owner secures a permit and his work is subject to supervision by the program's administrator. The property owner may also secure a permit to maintain trees or remove trees classified as "Progressive removal." While all such trees may normally be removed at city expense, a property owner might prefer not to wait until the time for the tree's scheduled removal; therefore, he may secure a permit and remove the tree at his own expense.

If the city is faced with shortages in manpower or equipment, property owners may be encouraged to plant, trim or alter "General maintenance" trees or remove "Early" or "Progressive removal" trees.[56] Some cities require abutting owners to keep street trees trimmed according to standards specified by the city.[57] Other cities may require "Early" or "Progressive removal" trees to be removed by the abutting owner.[58]

Some cities plant downtown trees;[59] others do not, but specify which contractors may do the work.[60] Cities normally maintain downtown trees but daily maintenance, such as watering and removal of litter from tubs, is required of abutting owners.[61]

Since property owners are generally unqualified to properly transplant and maintain trees, it is recommended that the city perform all tree work, permitting the property owner to only water trees. However, in large cities or in cities where there are shortages in manpower, equipment or time, and the city does not wish to carry out an official tree plan, property owners should be permitted to perform the following activities:

1. Plant street trees in conformance with the official tree list and planting specifications.
2. Maintain street trees according to specified standards.
3. Remove "Early" and "Progressive removal" trees according to specifications issued by the administrator.

Work by Public and Private Utilities and Private Arborists. Most cities with tree programs permit utility companies to trim street trees

but only under the direction and control of the program's administrator.[62] Some cities require that electric companies see to it that trees do not come in contact with electric wires.[63] In most cities with tree programs if a utility company feels that a "Progressive removal" tree should be removed earlier than its scheduled removal, the company may obtain a permit from the administrator and remove the tree at its own expense.[64]

Public utilities providing gas, water, electric, telephone or telegraph service to residents may normally, in emergency cases where street trees are interfering with and interrupting a service, trim or remove branches of these trees only to the extent necessary to restore the service without first securing a permit.[65]

Some cities provide for the issuance of yearly permits to utilities and private arborists or tree surgeons, avoiding the time and expense of granting individual permits for each job.[66]

Tree Removal for House Moving. If a tree is classified as "Early" or "Progressive removal," a permit for removal should be granted to allow house moving. Whether or not a "General maintenance" tree may be removed for this purpose should be left to the discretion of the administrator.

The posting of a bond guaranteeing that street trees will not be damaged during house moving should precede the issuance of a house moving permit.[67] In Merced, California, the administrator of the tree program may require house movers to cut the building into segments small enough to move between existing street trees. He may also require

a specific moving route to protect street trees.[68]

Financial Policy Alternatives

The sources for financing municipal tree programs are: the general city funds, street tree tax, the establishment of local improvement districts, and special assessments. A city can finance its tree program using one or a combination of these financial sources according to the city's financial capability and custom.

General City Funds. Cities financing the tree program from the general fund normally supply, replace, plant and maintain all street trees at city expense.[69] This method is the most widely used in cities with advanced tree programs.

Street Tree Tax. Some cities levy a street tree tax for the planting and care of street trees.[70]

Local Improvement Districts. A city may divide itself into local improvement districts, estimate the cost of the tree program within the district, and then make special assessments on all real property lying within the district.[71] This system is best for determining the feasibility and acceptability of a tree program in that a particular area may be used as a "model" or "testing ground." It is also ideal if the residents of a particular neighborhood wish to carry out a tree program while the remainder of the city may not be sold on the idea.

Special Assessments. In many cities, special assessments are levied against abutting owners for street tree planting or maintenance. Several New Jersey municipalities charge the costs of all street tree plantings and removals performed by the municipality to abutting

owners who are required to pay the city's Shade Tree Commission or the cost becomes a lien upon their property.[72]

Cities generally charge subdividers on either a "per tree"[73] or "front foot of lot"[74] basis for plantings the city performs in new subdivisions. Maintenance costs are also assessed against the subdividers for two years because of the intensive care the many young trees require.

Downtown street tree plantings are also often assessed against abutting property owners because of the high costs involved in installing sidewalk, tub or container plantings. However, subsequent maintenance is normally financed by the city.[75]

Alternative Policies for Obtaining Required Trees

The administrator should determine how the city may best obtain plant stock in adequate quality and quantity. A problem often encountered in tree programs is the lack of suitable plant material. Cities often have to purchase second-rate trees because the most desirable ones are not grown, or if they are, they are not grown in adequate numbers. Ordinarily, nurseries do not grow trees especially suited for street tree planting because these trees are too expensive to be produced in quantity.

Establishment of a City Nursery. The administrator may recommend that the city establish its own nursery, growing trees which will be planted on streets, in parks, and on other public properties. This has been done in many cities, including Lansing, Michigan,[76] and Fresno[77]

and Modesto, California.[78] Fresno also has a municipal tree farm. The tree farm serves as a growing grounds for the development of four to eight year old trees which are used as replacement plantings in older areas of the city.[79]

The city should adopt a continuing experimental growing program if a city-owned nursery is established. Modesto, California, attempts to develop new varieties of trees for street planting.[80] Anchorage, Alaska, has an experimental program to determine which varieties of non-native trees may be planted on the city's streets.[81]

Contracting for the Growing of Trees. If the city does not wish to establish a nursery, an alternative for obtaining plant stock is contracting, by the city, with commercial nurseries for the growing of suitable trees for the city's streets, as is done in Sunnyvale, California. Sunnyvale found that to grow its own trees was too expensive an operation. It further found that availability of suitable stock in the wholesale nursery industry was becoming a critical factor. Therefore, the city contracts with growers to produce trees to its specifications.[82]

In New Jersey, several municipalities contract with commercial nurseries for the future delivery of trees for street planting. Municipalities place in escrow a sum of money from current appropriation for shade tree work to pay for trees that will be delivered four or five years hence.[83]

In cities where property owners are allowed to plant trees (but only after securing a permit from the program's administrator), the

city should specify the nurseries from which the property owner may obtain trees.

Program Implementation

After the responsible official has made his recommendations as to what the city's policy should be with regard to city control and participation, how the program should be financed, and how the required trees are to be obtained, the city administrator will make the final decision as to the policies the city will follow. The program's administrator would thereafter draft a tree control ordinance which, upon its adoption, would place the tree program into effect.

The Tree Control Ordinance

The tree control ordinance should provide for the planting, protection, preservation and control of all street and public trees and specifically provide for direction and jurisdiction over all planting, maintenance and care of trees along city streets. (The ordinance may also regulate private trees. These provisions are discussed in chapter III.)

Specifically, the ordinance, in addition to officially designating a program administrator and operating body, should specify their duties and activities in carrying out the tree program. It should specify the extent to which the city will participate, physically and financially, in the program and what work may or will be done or paid for by the property owner and the procedure for obtaining permits for such work. Provision for appeals by persons

aggrieved by the city tree plan or survey classifications as they relate to trees in front of their property may also be included. (A sample ordinance is contained in Appendix B.)

In addition to establishing the foregoing basic policies, the ordinance will generally prescribe certain specific measures for the implementation of the tree program. Among these may be the incorporation of an official tree list, the preparation of an official tree plan and the determination of standards and specifications for tree planting, maintenance and removal.

Official Tree List

The tree control ordinance will usually require the administrator to formulate an official tree list which is a list of tree species that are suitable for planting in, or immediately adjacent to, rights-of-way in a city. The list should give all pertinent information regarding each species. The purpose of the list is to provide those who will select trees for street planting or those formulating a tree plan for the city with information as to which tree species are suitable for various locations throughout the city. The administrator may require assistance in developing this list from someone who knows trees and local conditions, such as a landscape architect or a specially appointed committee of tree experts.

Although there is no perfect street tree, there are certain species which fare relatively well on city streets. On the basis of an extensive examination of ten lists of criteria used for selecting the

most suitable street trees, the author recommends the use of the following criteria:

1. Vigorous trees, entirely hardy, that will withstand growth conditions of city streets.
2. Trees that are long lived and not too slow of growth.
3. Trees that are strong, not brittle or subject to breakage in ordinary storms.
4. Trees that are neat, not given to dropping a constant litter or subject to messy or injurious forms of disease or insect infestations.
5. Trees having a firm, tough bark not easily bruised or damaged.
6. Trees having good, deep, compact root systems and high branching habit.
7. Trees providing good shade, yet not so dense as to prohibit grass growth and with foliage that will wash clean in a rain.
8. Trees <u>not</u> having conspicuous flowers or edible fruits or nuts. Experience has proven that it is practically impossible to protect such trees from being badly mutilated by the public.

The list should also include pertinent data on each species' nature and habits, growth characteristics, site requirements (such as size of growing area required and desirable spacing distance), its desirability for special uses and its peculiar advantages and disad-

vantages (See Appendix C.)

After its completion, the official tree list is incorporated into the tree control ordinance. Generally, in cities that permit property owners to plant trees, this list is used as a device for controlling the selection of species for street tree planting.[84] The trees are categorized (usually into required planting strip widths for their planting; the category, "For planting six feet inside the sidewalk," is sometimes added.) With this classification, property owners (and the administrator) may select trees to suit their location. The data on the particular characteristics of each species permit the person planting a tree to better select a tree suited to its environment. For instance, information on the tree's ultimate spread and shape (usually shown by illustrations) will avoid the planting of a tree that would require excessive pruning to permit pedestrian or traffic clearance.

The official tree list should be revised from time to time by the Street Tree Board.

Official Tree Plan

Some ordinances[85] require the administrator to develop an official tree plan. This procedure is followed primarily in cities that perform all planting, maintenance and removal of street trees.

An official tree plan usually designates several types of trees for planting in planting units (which normally extend several blocks or until there is a change in land use or a marked change in average building setback). The purpose of this plan is to insure orderly tree

planting within and near street areas. The official tree plan is an additional step to the official tree list in that tree types are designated for planting units in consideration of all factors that affect a tree's desirability for each unit.

If soil or climatic conditions vary widely throughout the city, an experimental growing program might be undertaken to determine the soil and wind tolerances of different trees at various locations throughout the city, as was done in Richmond, California.[86]

A necessary step in the preparation of the plan is a decision as to how many species should be designated for each planting unit. For some planting units, only one type of tree may be designated, permitting uniform planting unit by unit, blocking the trees into units with identical maintenance requirements and facilitating street tree purchases. One objection to this practice is the fact that if one tree dies, the subsequent planting of a young, and naturally, small tree would result in a loss of attractiveness in the planting unit. As a result, the new tree would be out of scale with the older plantings. Fresno, California, has overcome this problem by growing, in its Municipal Tree Farm, trees of different ages and sizes, to use as replacements.[87] At any rate, as many different species as practicable should be recommended throughout the city to avoid monotony and the possibility that a disease epidemic might wipe out many trees. The Official Tree Plan of Davis, California, specifies that not more than 5 per cent of any one kind of tree is to be used in the entire city.[88] On short or curved streets, two species may be designated for variety

within a unit. Cities often inter-plant tall trees with smaller, decorative types, not necessarily formally or in straight rows.

In formulating the tree plan, several factors affecting species selection for each unit must be taken into consideration. The administrator should consider all site factors revealed in the tree survey and determine which type (or types) of tree should become the official trees for each planting unit. A tree may be selected from the official tree list to correspond with the character and site factors of a particular planting unit. For example, a tree may be selected that is adapted to present and future land use (such as good shade trees in residential areas or chemical-resistant trees in industrial areas), width of planting strip (to avoid root interference with sidewalks or underground utilities), present and future width of street, average building setback, overhead wires or street lamps, soil, topography and climate.

For treeless streets which are to be widened in the near future and on which the average building setback is narrow, small, rapidly growing, short-lived trees should be designated. Where there are numerous trees on private property, no street tree planting may be required. In designating trees for bare slopes adjoining city streets, desirable trees which would control erosion should be selected.

A recommendation regarding tree location—whether trees in the unit should be planted in the planting strip or six feet inside the sidewalk (or curb where there is no sidewalk)—should accompany the species designation for each unit. Trees should be recommended for planting four to six feet inside the sidewalk or curb where planting

in the planting strip would obviously result in interference with vision, clearance of underground or overhead utilities or sidewalks, snow removal or street widening, or where the average building setback is deep. (If public right-of-way location is not designated, this would require placing the trees on private property; this is discussed in Chapter III.)

Existing trees present a special problem. If a unit's existing trees have been classified as "General maintenance" in the tree survey and are on the official tree list, future plantings in the planting unit should conform with that variety. Where several species of these trees exist on a street, the best variety might be designated as the official unit tree and the others added to the "Progressive removal" list.

The designation of trees for planting units may be shown on a map, using codes, as is done in the West Covina, California, Official Tree Plan, or the designation may be presented in typed, chart form, listing the designated tree by planting unit, as is done in the Lyndhurst, Ohio, Official Tree Plan.

After the plan is adopted and initiated, the administrator should give consideration to locating the trees in each planting unit. The spacing of trees within a planting unit is usually not specified in the official tree plan. Thus the administrator may exercise his discretion in such matters as whether to locate the trees in opposite or alternate patterns on each side of the street or to informally arrange the trees, with irregular spacings. However, he should refer

to the tree list for desirable spacing distances between trees, seeing to it that none of the trees is located so that ultimate overcrowding might result. (Overcrowded trees compete with each other for sunlight, water and growing room, to the detriment of each. Also, such dense shade may result that grass growth is prohibited.) Some cities plant one tree per lot;[89] however, in locating the trees, the administrator should not adhere to this practice. Instead, spacing should aim to achieve maximum planting effect within each unit, according to the spacing distance recommended in the tree list based on each tree's ultimate size and shape, without regard to where property lines fall, so that the appearance of the entire street or planting unit, rather than individual properties, will be enhanced. One city, Sunnyvale, California, reports great success with this technique.[90]

The Street Tree Board should advise the administrator when deviation from the official tree plan is requested. When new streets are platted, the Board should recommend tree species to be added by the administrator to the official tree plan.

Standards and Specifications for Planting and Maintenance

The administrator should prepare tree planting and maintenance standards and specifications, which will apply to tree work performed by the city and, also, by property owners, if they are permitted to perform tree work. These regulations would include standards and specifications pertaining to the location of trees in relation to other objects such as poles and intersections, transplanting of trees, quality of planting stock, and maintenance, including trimming, removal,

spraying, and fertilization. (See Appendices D, E, F.)

Scheduling the Program

The ordinance will require the administrator to schedule the tree program on both a long-term and annual basis. Long-term scheduling of the tree program may be made from the tree survey classifications. "Progressive removal" trees should not be allowed to stand longer than ten years at the most, so the program might aim at the removal of all "Progressive removal" trees, and the replanting of all planting units, within ten years after the program's initiation. If a street tree or forestry division is established, with the men working full time, six years might be the goal for the "planned-planting look." Of course, the long-term scheduling will depend upon the extent and type of tree work to be done. The size of the city will also be a factor—smaller cities can usually be replanted faster than can large ones.

In establishing the annual schedule, the administrator will have to take several factors into consideration. In each city there is a time of year that is best for planting and best for spraying. If the tree program crew is working full-time, planting and spraying should be scheduled for this work at the desired time of year; if the crew is regular park or public works department personnel, the men should be transferred from their park or public works department chores and assigned to work on street tree activities at the desirable time of year.

Another priority assignment list the administrator should develop is that of determining which "Early removal" trees should be

removed first. These trees should be removed in a "spot" manner, all over the city and not in a planting unit by planting unit method. A general rule would be to remove first those trees that are most hazardous to public safety and, second those creating the highest maintenance costs.

Planting priorities should be established, the most barren areas being planted first, after which a progressive, unit by unit, routine method of planting should be followed.

No maintenance priorities (except spraying) should be followed. Trees creating safety hazards or causing high maintenance costs should be "spot" maintained unless they can be removed; otherwise, a routine, unit by unit method should be followed, each tree receiving whatever maintenance treatment it needs in rotation, unit by unit. Maintenance should be planned so that each tree will receive routine maintenance at least once every four years. If the city is small, the time will be less. In Englewood, New Jersey, the rotation maintenance program is set on a one-year basis.

"Progressive removal" trees should also receive routine maintenance until their removal. If a full-time crew is used, most trimming should be done in seasons when trees are not being planted, to more evenly distribute the work load throughout the year. If regular park or public works department crews are used, they will probably be most available for trimming during the winter months but they should be made available for planting and spraying at the desirable times of year for these activities.

In setting up yearly schedules, the administrator should provide for the blending of four separate programs:

1. The removal of "Early removal" trees according to their priority;
2. Routine maintenance—trimming, pruning and other treatment—of all "General maintenance" and "Progressive removal" trees in a rotation system;
3. Planting by priority areas first then progressively by planting unit, during the desirable month or season for planting; and
4. Spraying of certain trees in the desirable period.

Equipment and Personnel for the Program's Implementation

To implement the program, the administrator must determine equipment and personnel needs.

Equipment. A list of minimum equipment requirements in a municipal public land tree program would include a stake body truck (with dump attachment), a flat bed truck with boom and cable winch attachment, a tree sprayer, three power chain saws, small hand tools and materials such as axes, spades, pruners, special tools for cavity work, cabling, bracing, rope, block and tackle, insecticides, fungicides, and wound dressing material, all of which would cost about $13,000. This list was prepared for a city of 100,000 people and with 15,000 street trees.[91] Iowa City, Iowa, less than half this size, has the above equipment plus a stump remover (Cost: $400) and brush

chipper (Cost: $2,500).[92] San Diego, California, with over half a million people and 150,000 street trees, plus many more on other public property, uses aerial mobile towers, a tank truck for watering, and a power auger for fast but effective planting.[93]

The equipment a city must purchase will depend largely on the existing equipment which will be available to the department carrying out the program. In Modesto, California, equipment is assigned to the Street Tree Division of the Park Department from a central equipment pool. Some equipment, such as an aerial mobile tower and brush chipper, are assigned on a monthly basis, since the use of this equipment is confined to the Parks and Recreation Department; whereas, other equipment such as tractors, bulldozers, and scoops are assigned on a daily basis as needed, more extensive use of this equipment being made by the Public Works Department.[94]

A larger investment in equipment used in the tree program may prove desirable. In Englewood, New Jersey, a city of only 28,000 persons, and with 14,000 public trees, equipment used is valued at $40,000. A special feature is the utility truck which contains a light control panel for emergency lights; generators furnishing power to electric chain saws, climbing gear, hand saws, gasoline and oil, flares and signs for protecting work sites; a communication system which permits directing the truck operator from a position 100 feet from the truck; and a winch and tripod derrick. Blocks, shovels, rakes, pole saws, pole pruners, and ladders are also carried on the truck. This fully equipped truck, which represents more than five

years of study by the Department of Parks and Shade Trees, is valued at $17,000.[95]

Personnel. Men experienced in tree work, such as climbers, trimmers, and ground men, are often found in the park or public works departments. If a separate street tree or forestry division of either department is created, these men should be placed in the division under a supervisor responsible to the department head. If no such division is created, a special crew should be selected from park department personnel for the annual or periodic street tree work.

In Modesto, California, the Street Tree Division of the Parks Department is headed by a Foreman who is responsible to the Park Superintendent. The Division, responsible for all public trees, has two operating crews. The Young-Tree Maintenance Crew, which plants, water-jet aerifies (washing out holes to encourage deep rooting and to provide channels for air, water, drainage, fertilizer, and soil amendment distribution), shapes, sprays, waters and otherwise maintains young trees, consists of one leadman, two tree trainers, three maintenance men, and one part-time laborer. The High-Tree Maintenance Crew, which performs all maintenance and removal operations on all old trees, including topping, pruning, thinning, removing dead-wood, and spraying, consists of, in addition to a leadman, a part-time laborer and four maintenance men, four tree trimmers. A nursery man and a maintenance man operate the city nursery.[96]

In Manhattan, Kansas, a city of 23,000 people and with 12,000 street trees, five full-time and three part-time men perform public

tree work.[97] The Shade Tree Division of the Park Department in Englewood, New Jersey, is composed of a staff of ten.[98] In San Diego, California, the Street Tree Division of the Park and Recreation Department has a total personnel of 37, including maintenance, trimming, removal, watering and planting crews.[99]

Preparing Annual Budgets

The administrator should prepare an annual budget for the tree program. A prime consideration in determining program expenditures is the program's initial cost. In preparing the budget for the first year, the administrator must consider the costs of new personnel, equipment, and stocks of trees for planting and replacement, depending on what the city already has. If considerable new personnel and equipment are needed, the initial costs of the program might be sizeable. However, as some cities have found, appropriations for these initial items are much greater than appropriations needed in subsequent years when the program is well established. University City, Missouri, found that costs of its program have declined year by year.[100]

Based on a study of tree program expenditures in ten cities with public land tree programs, the following averages of annual costs, per tree, including labor, were determined. All figures include overhead costs.

1. Planting, (including tree and stake)
   in areas other than downtown sections . . $ 8.00
   For downtown areas, this figure is $50.00,
   including breaking the concrete,

excavating the holes and constructing temporary barricades. For plantings in tubs or containers, the figure is $150.00, including material.

2. Spraying . . . . . $ 2.00
3. Trimming and Pruning 4.75
4. Maintenance of Downtown Trees 15.00
5. Removal 60.00
6. Stump Removal 15.00

By correlating the above figures with the classifications assigned in the tree survey, the annual budget for a tree program may be predicted. If the city will require property owners to perform some of the above activities or will perform the work yet charge the owners, the annual budget will, of course, be somewhat lower. Also, if the regular park or public works department crews perform the work the figures will be lower.

Public Relations

The public relations function is a responsibility of the administrator. If the city is to do most or all of the tree work, a statement should be sent to all property owners, clarifying and justifying future tree actions to be performed by the city. This statement would also include conditions under which a property owner could plant, maintain, or remove trees and the required procedure for such action.

In cities where property owners may, or are required to, participate in the tree program, each property owner or resident should

be sent the proposed plan for trees in front of his property, including a copy of the planting, maintenance and removal standards and specifications. The procedure for obtaining permits for the performance of such work should also be included.

Obtaining County and State Assistance

The program's administrator should investigate means of obtaining assistance from the county and state so that the entire urban area may be beautified and receive other benefits that may be derived from public land tree programs.

County Assistance. Two California Counties, Fresno[101] and Placer,[102] have adopted county tree control ordinances controlling trees on or overhanging public highways of unincorporated county areas. These ordinances were adopted with the consent of the State Highway Department. Their purpose is to insure attractive city approaches, reduce tree maintenance costs and insure orderly arrangement of trees in expanding suburban areas. When areas of the county are annexed by the city, fewer tree problems are acquired, facilitating city tree maintenance.

Wayne County, Michigan, carries out an annual program of roadside development, 80,000 trees being planted since 1922.[103] A California County, Contra Costa, has adopted a roadside beautification policy, under which the County's Park Division of the Public Works Department buys, plants and maintains trees for roadside beautification.[104]

State Assistance. State Highway Departments often undertake tree planting programs for state highways in urban areas. A city

undertaking a public land tree program should seek assistance in roadside beautification from the state highway department. For example, officials in El Gato, California, petitioned the State Highway Department to beautify its city approaches. The Department responded by planting trees on major highways within and near the city, the Department agreeing to maintain the trees.[105] California's Highway Department does a considerable amount of tree planting in urban areas, for purposes of beautification, erosion control, median or right-of-way screening and traffic delineation.[106]

The Georgia State Highway Department cooperates with cities, counties and private organizations in tree planting projects for roadsides. Landscaping projects on Georgia highways are referred to the Bureau of Public Roads for approval. The Bureau sometimes pays part of the cost of such projects.[107]

The State Highway Department in Florida has been authorized to sponsor planned planting programs. A considerable amount of the planting done to date has been in urban areas.[108] A considerable amount of the expenditures for tree planting on New York State portions of Interstate Highways has been in metropolitan areas.[109]

Obviously, obtaining such funds will contribute greatly to the success of municipal tree programs.

A Continuing Stimulus

To maintain and renew interest in the tree program, an annual "Plant a Tree Week," in which citizens are encouraged to plant trees on their own properties, may prove effective in balancing a program

of public planting. Several cities, among them St. James, Missouri,[110] and San Francisco, California,[111] have effectively employed this measure.

Summary of the Administrator's Duties in Program Implementation

In implementing the tree program the administrator will assure that his actions are in accord with the tree control ordinance and will carry out all measures specified by the ordinance. Since it is neither possible nor desirable, however, for the ordinance to specify every detail, the administrator will have to establish many policy details and administrative procedures on his own initiative. It will fall to him, too, to win support for his program from the city officials charged with overall policy making and from the general public.

Conclusion

The implementation of a municipal tree program will offer to a community the maximum tree benefits and a minimum of problems. A tree program should include, but not be limited to, the selection of a good program administrator, the formulation of the policy the city desires to follow, the drafting of a tree control ordinance tailored to meet the city's needs, and the implementation of the program by its administrator who will supplement defined policy by exercising initiative and judgment.

CHAPTER III

THE REGULATION OF TREES ON PRIVATE PROPERTY

Many municipalities regulate trees on private property. The public regulation of trees on private property is a police power control to promote the general welfare, to protect private properties and their value and to protect public interests and property.

The control of trees on private property includes regulations that: require the planting, maintenance or removal of trees; prohibit tree planting or removal; and regulate the types of trees that may be planted. This chapter will review both public and private regulation of trees on private property.

Public Regulations

Regulatory devices a municipality may employ for trees on private property are a tree control ordinance, land subdivision regulations, a tree cutting and removal ordinance, and zoning.

Tree Control Ordinance

In the formulation of an official tree plan, which is normally incorporated into a tree control ordinance, a specific type of tree is designated for planting within each planting unit, as was discussed in Chapter II. In areas where there is no planting strip or where the planting strip is too narrow for trees, any tree planting must take place on private property on the inside of the sidewalk or curb or

pavement border. Cities may obtain jurisdiction over tree planting and maintenance within this area through the acquisition of easements.

Obtaining Tree Planting and Maintenance Easements. The city of Groton, Massachusetts,[112] along with several Maine municipalities,[113] often obtain a tree planting and maintenance easement on private property extending six feet beyond the public right-of-way. With this type of arrangement, a city may carry out its official tree plan for trees that are standing or to be planted on private property within a specified distance beyond the public right-of-way. (Cities may also provide for easements of this type in the development of new land subdivisions. This is discussed under Land Subdivision Regulations.)

Regulating Selection of Species. A city may also, through its tree control ordinance regulate the types of trees which may be planted on all, or certain areas, of private property. The planting of certain species may be prohibited anywhere in the city, as is done in the Bakersfield, California, Ordinance. Trees prohibited are those that are strongly susceptible to disease; that bear seeds of a cottony or downy nature that cannot be confined to a single property; whose roots and leaves are poisonous; or that are foul smelling. Petaluma, California, through its Official Tree List, which is incorporated into the Tree Control Ordinance, controls species of trees which may be planted in both front and rear yards of private properties.[114] Other cities list trees which may not be planted within a specified number of feet of public property for the purpose of protecting sidewalks and streets from damage by strong, laterally-growing roots.[115]

Maintaining Private Trees Overhanging Public Property. Trees located on private property, but whose limbs overhang public property, are usually not included in maintenance and removal services provided by the city. Rather, the person owning or occupying the property on which these trees are located is required to trim the trees so that the limbs and undergrowth will not hang or extend down over the sidewalk less than a prescribed height from the street or sidewalk level. In Wichita, Kansas, this figure is eight feet.[116] Ordinances also require owners of private trees to trim branches that obstruct the light from street lamps.

Wichita, along with Sturgis, Michigan, and many other cities, through their tree control ordinances, also require that any debris falling onto public property from trees located on private property be removed by the private owner. Property owners failing to comply with these tree-trimming and debris-cleaning requirements are penalized in one of two ways. In Wichita, failure to comply brings fine and/or imprisonment.[117] In Sturgis, should the property owner fail to comply, the city does the work and charges the cost to the property owner in the form of a special assessment.[118]

Some cities accept the responsibility for trimming and removing debris from trees overhanging public property. Examples are Grosse Pointe[119] and Grand Haven, Michigan.[120]

Regulating Hazardous Trees. Tree control ordinances require property owners to remove or properly treat hazardous trees standing on private property. An example is the Ordinance of Wichita, Kansas,

which requires property owners to remove and burn diseased or dead trees or broken branches. If the property owner or occupant does not comply, the city does the work and levies a special assessment against him.[121]

Some tree control ordinances prohibit the blocking of intersection visibility by trees. For example, the Birmingham, Michigan, Tree Control Ordinance protects intersection visibility by requiring, in the case of corner lots, that all trees, bushes, shrubs or plants located in the triangle formed by two property lines at the intersection of two streets and extending for a distance of 25 feet each way from their intersection, shall not be permitted to block the view in the space between a vertical height of three feet and eight feet above the roadway surface.[122]

Land Subdivision Regulations

Through land subdivision regulations, municipalities may require tree preservation or planting in new subdivisions. This type of regulation has been upheld in a court decision in California.[123]

Some cities, while not requiring tree preservation in new subdivisions, require that it be considered. The Atlanta, Georgia, Land Subdivision Regulations state: "When feasible, all trees of major growth in the subdivision will be preserved."[124] The Cordele, Georgia, Subdivision Regulations state: "Large trees shall be preserved whenever possible because of their value in soil conservation, health and community well-being."[125] Riverside, California, requires subdividers to show on tentative subdivision maps all existing trees and their types

and diameter. The planning commission may recommend the retention of certain trees.[126] The Los Angeles Subdivision Regulations require that the location and general description of all large or significant trees be shown on tentative tract maps.[127] In Los Angeles at present, the developer is not required to preserve existing trees but the Planning Commission has proposed that a section requiring the preservation of these trees be included in the Subdivision Regulations, and it believes that this measure will be adopted. (A map of significant trees in the urban area is now being prepared.)[128]

Glendale, California, in an area where land slides are frequent, requires that trees which would be effective in slide prevention be preserved. Existing trees which would become street trees must also be spared.[129] Saratoga, California, requires all existing trees to be shown on tentative subdivision maps and prohibits the removal of any tree without the permission of the Planning Commission.[130]

Tree planting requirements are also found in land subdivision regulations. These may pertain to trees which are, or are not, to become street trees. The Subdivision Ordinance of Cordele, Georgia, requires the developer to plant street trees, vaguely specifying the species to be planted.

Since cities have had poor success with tree plantings made by developers (a high mortality rate usually resulting), some cities elect to perform the required tree planting and maintenance, charging the developer for these services. In Sunnyvale, California, tree planting paid for by the developer is required in new subdivisions.

Tree funds are deposited with the city in the same manner as are utility and street improvement funds. The city's Parks and Recreation Department does all street tree planting. The city calculates from the subdivision map the number of trees required and the amount to be deposited by the city. When building construction is complete and buildings occupied, the city plants the trees.[131] In Davis, California, at the time of subdivision development, the city requires the subdivider to deposit in cash or bond a sum equal to 30 cents per front foot of lot facing the street to cover the cost to the city of planting street trees.[132]

If the developer is required to select the species and perform the planting, the species selected should be approved by either the planning commission or the parks or public works department. In Hemet, California, the Park Board approves species selection.[133] In Redwood City, California, species must be recommended by the Parks Department Superintendent and approved by the City Engineer.[134] Glendale, California, requires that a licensed landscape architect prepare a landscaping plan, which must be submitted to and approved by the Planning Director and the Director of Public Works.[135]

The Redwood City Regulations also state: "Street trees not less than one in each lot or more than fifty (50) feet apart shall be required." Sunnyvale, California, requires that street trees be located and spaced so as to attain maximum planting effect without regard to property lines. In this case, the city engineer or park superintendent recommends the location of each tree.

The reaction of subdividers to tree planting requirements has generally been favorable. Reports from Garden Grove,[136] and Glendale, California,[137] indicate that developers have accepted the requirements in a cooperative manner. They are likely to stress the landscaping as one of the features of their sales campaigns.

The problems of species selection and location and planting and maintenance are solved if an official tree plan, as discussed in Chapter II, is adopted. Under this procedure, in a new subdivision the administrator of the tree program selects a species from the official tree list, adds the streets of the new subdivision to the official tree plan, and then proceeds to plant each street or planting unit and to provide maintenance. The developer may be charged for the planting and for the first two years' maintenance. This procedure is followed in Davis, California.[138]

Obtaining Tree Planting and Maintenance Easements. In new subdivisions as on existing streets, if the city wishes trees to be placed on private property, a tree planting and maintenance easement should be obtained. The subdivision regulations may require that such an easement be dedicated by the developer and that trees be planted in the area extending six feet inside the right-of-way. These plantings may be required of the developer, as in Hollister, California,[139] or of the city, as in Davis, California.[140]

Requiring Buffer Strips. Most subdivision regulations require a planted buffer strip in new subdivisions at the rear of lots backing on major thoroughfares. A portion of the Redwood City, California,

Subdivision Regulations is as follows:

> When the rear of any lots border any major or secondary street, freeway, state highway or parkway, the subdivider may be required to dedicate and improve a planting strip adjacent to such major or secondary street, freeway, state highway or parkway. [141]

Trees planted in this strip are subsequently controlled and maintained by the city.

Street Tree Plantings in Industrial and Commercial Subdivisions. Many cities, among them Los Angeles, require tree plantings in commercial and industrial subdivisions.[142]

Requiring Trees Other Than Street Trees. Land subdivision regulations may require trees other than street trees. Saratoga, California's Land Subdivision Regulations require at least two approved trees in an area other than the front 35 per cent of each interior lot and at least four trees (other than street trees) on corner lots. Existing trees, if desirable, may fulfill this requirement but if there are no trees, the required number must be planted. The trees are then maintained by the property owner.[143]

Tree Cutting and Removal Ordinance

Cities may regulate the cutting of trees on private property. Two California cities, Pacific Grove and Carmel, have adopted such regulations. A portion of Pacific Grove's Tree Cutting and Removal Ordinance, in effect since 1947, is as follows:

> It is pertinent to the welfare and safety of all of the citizens of said city that trees be left in as great numbers as possible in order to provide the city with an adequate windbreak and for conservation purposes, as well as for the

> preservation of the natural beauty which said trees lend to the City . . . . It has been determined by the Council of said City that proper and necessary steps must be taken in order to curb the wanton destruction of trees and to protect the health, welfare, and safety of the citizens of Pacific Grove.[144]

No tree of any kind or character growing within the city may be cut down, removed, or moved without permission from the City Manager. Each person, firm or corporation wishing to cut down, remove or move any tree or trees is required to pay two dollars ($2.00) for a permit to do so. A permit enables its bearer to cut, move or remove not more than five trees on a single parcel of real property.

Before a permit is issued, the City Manager, or his designated representative, inspects the premises involved and designates the tree or trees that may be cut down, removed, or moved. Where more than five trees are to be removed from, or moved from place to place upon, a single parcel of real property, the application is referred to a Beautification Committee for recommendation to the Council. In case of dissatisfaction by any person, firm or corporation, appeals may be made to the City Council.[145]

In regard to the Tree Cutting and Removal Ordinance, the City Manager comments:

> This ordinance has been enforced with common sense, allowing property owners to make use of their property. Trees lying inside the proposed building lines and driveways have been allowed to be removed and the owner encouraged to plant trees to take their place. . . . This ordinance has worked well in spite of the almost 100 per cent development of land in Pacific Grove. . . . Several cities have asked for copies of our ordinance with the idea of following it.[146]

Zoning

A zoning ordinance may require the planting of trees on perimeters of off-street parking lots. The ordinance may specify the general type (such as evergreen or ornamental), the spacing, and the location (usually in relation to a required wall) of trees to be planted, and conditions for their subsequent maintenance. The Detroit, Michigan, Zoning Ordinance does this.[147] In addition, a certain percentage of the gross area of a parking lot is sometimes required to be landscaped, as in Pasadena, California.[148]

Zoning ordinances sometimes require tree planting in commercial, industrial, and certain apartment-house developments. For example, Sunnyvale, California, requires that, in commercial and industrial districts, an area equal to at least 10 per cent of the building floor space must be landscaped, including tree planting. Walkways may be a part of this 10 per cent but all parking and vehicular access roads are excluded. No portion of the public right-of-way, where street trees are also required, may be included in the 10 per cent. The required trees must be approved by the Parks and Recreation Department.[149] The zoning ordinance of Monterey, California, empowers a Site Control Committee to require tree planting or retention in areas of new development.[150]

Many cities require buffer tree planting to protect the value of residential properties which are across the street or which back upon commercial properties.

Other Methods of Regulating Trees on Private Property

Tree planting, maintenance and removal on private property may be regulated through financial requirements and through private deed restrictions.

Federal Housing Administration Requirements

In new subdivisions approved for mortgage insurance by the Federal Housing Administration, the subdivider is required to provide at least one tree per lot. Mr. James J. Hamby, Area Site Planner for F.H.A. in Atlanta, Georgia, says that F.H.A. tree planting requirements differ throughout the country. In some areas, trees may be street trees, planted either within a planting strip or inside the property line; in other areas, trees must be planted on the lots themselves, entirely removed from public property. The selection of the type of tree to be planted is usually left up to the city; however, F.H.A. sometimes specifies the species to be planted. In Georgia, the F.H.A. requires, in large subdivisions, that at least one high-growing, deciduous tree be planted somewhere on each lot, at least 20 feet away from building.[151]

Private Deed Restrictions

Private deed restrictions may incorporate requirements for tree planting, retention or maintenance. Such deed restriction requirements are sometimes incorporated in land subdivision regulations. For example, a portion of the Wichita, Kansas Land Subdivision Regulations is as follows:

> Where the subdivision contains . . . street trees or other physical facilities necessary or desirable for the welfare of the area which are not satisfactorily maintained by any existing public agency, provision shall be made by trust agreement, made a part of deed restrictions, acceptable to any agency having jurisdiction over the location and improvement of such facilities, for the proper and continuous maintenance and supervision of such facilities.[152]

In the Westlake Subdivision in Daly City, California, deed restrictions require tree planting in planting strips and on individual lots and specify the types of trees which must be planted. Species of trees were selected which will enhance the beauty of the neighborhood and which will not cause damage to public or private property. Although, technically, each tree is the property of the homeowner, the right of removal, replacement, pruning and maintenance is reserved by the Subdivision Improvement Association. All these operations are performed by the Association gardener. The cost of these and other association services is covered by a $7.00 yearly assessment paid to the Association by each homeowner.[153]

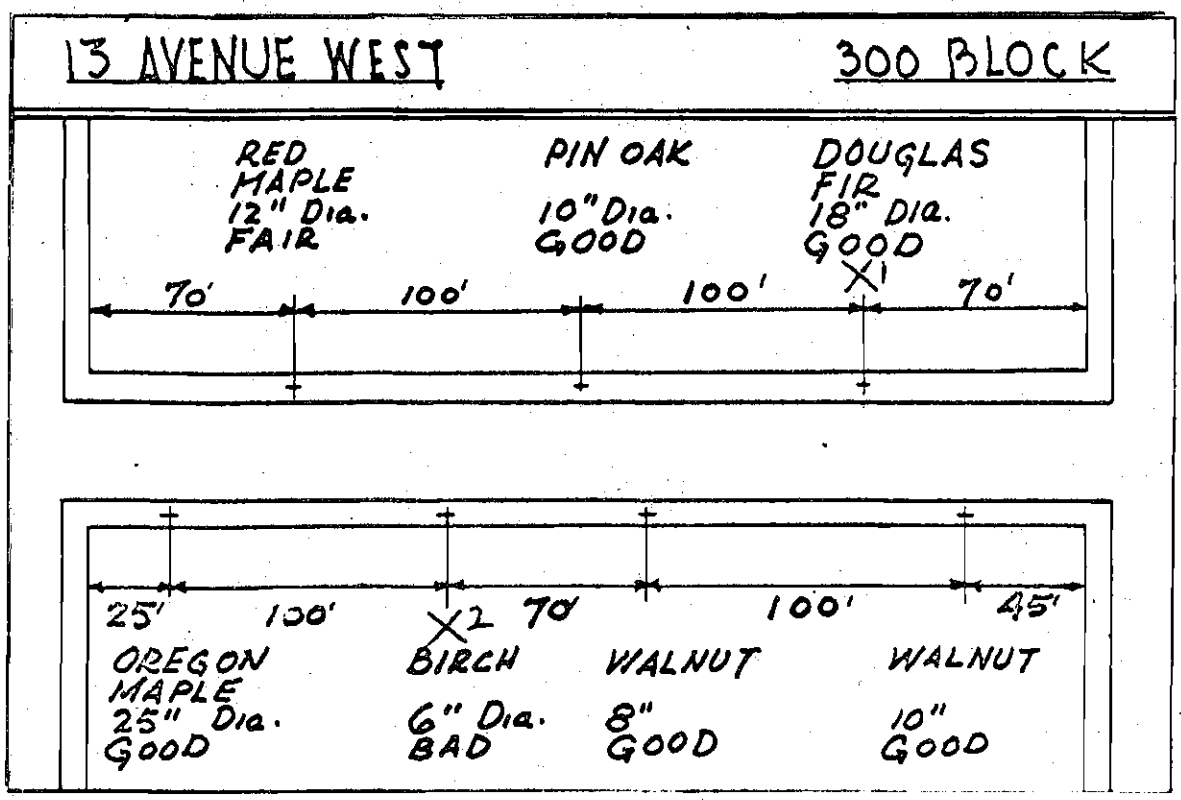
The Completed Tree Program

Through the measures discussed in this chapter, municipalities can exert considerable control over trees on private property. These measures supplement those affecting public lands previously considered. Together they provide a comprehensive tree program. There are available adequate public and private controls to permit a city to effectively regulate trees on both public and private property and thus enhance its appearance and liveability.

APPENDIX

APPENDIX A

BLOCK MAP FOR SURVEY[1]



KEY X^1: Growing into Wires

X^2: Interfering with Sidewalks

X^3, X^4, etc.,: According to Page 16 of Text

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1. Bureau of Municipal Research and Service, Street Trees for Cities, Portland, Oregon, The Bureau, 1947, p. 14.

APPENDIX A(CONTINUED)

DATA SHEET FOR SURVEY[1]

A--Apartments
B—Low Potential
C—Med. Potential
D—High Potential
E—Undeveloped

for th

CITY OF _____ Lyndhurs

STREET	BLOCK NUMBER	STREET DATA								CHARACTER OF STR.						OVERHEAD WIRES			LIGHTING				SITE FACTORS			
		Direction	Paving Width	Sidewalk Width	Tree Lawn Width	Lot Width	Bldg. Set-Back	Bldg. Height	PUBLIC Transport.	Business	RESIDENTIAL A	B	C	D	E	Height	Left or Right	Power or Phone	Center	Off Set	Upright	Corner	Underg'd	Drainage	Ph	Type of Soil
Mayfield Road	W. City Limit to Rich-mond	E W	70	6	10	70	85 +	1½ to 2½	Yes				X		X	CEI 20	N & S	OBT 15		N & S X		X			6.5	CLAY
Meadow Wood Boulevard	W. of Brainard to Sunview	E W	28	5	12	90	45	1	No				X			CEI 29	N	OBT 22		N Y					6.5	CLAY

1. Lyndhurst, Ohio, Tree Survey Data Sheet, Lyndhurst, The City, n. d.

APPENDIX B

SAMPLE TREE CONTROL ORDINANCE

CITY ORDINANCE NO. _____

AN ORDINANCE PRESCRIBING REGULATIONS RELATING TO THE PLANTING, CARE, AND REMOVAL OF TREES IN OR WHICH MAY OVERHANG THE STREETS OF THE CITY OF _____, COUNTY OF _____, STATE OF _____: PROVIDING FOR THE ISSUING OF PERMITS IN CONNECTION THEREWITH: PRESCRIBING PENALTIES FOR THE VIOLATION OF SAID ORDINANCE: AND REPEALING ALL ORDINANCES AND PARTS OF ORDINANCES IN CONFLICT THEREWITH (INCLUDING ORDINANCE NO. _____).

(ENDORSED BY THE NATIONAL SHADE TREE CONFERENCE, WESTERN CHAPTER[1])

The City Council[2] of the City of _____, County of _____, State of _____ does ordain as follows:

SECTION 1. Purpose. That it is for the best interests of the City of _____ and of the citizens and public thereof that a comprehensive plan for the planting and maintenance of trees in or which may overhang public streets within said city should be developed and established; and that this ordinance is adopted, therefore, for the purpose of developing and providing for such a plan and program, and for the purpose of establishing rules and regulations relating to the planting, care and maintenance of such trees.

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1. Officially endorsed by the National Shade Tree Conference, Western Chapter, at its 24th Annual Convention, Yosemite, California, May 8-11, 1957.

2. Or substitute title of appropriate body throughout.

SECTION 2. Definitions. The word "person" as used in this ordinance shall include an individual, a firm, an association, a corporation, a co-partnership, and the lessees, trustees, receivers, agents, servants, and employees of any such person.

The word "City" shall mean the City of _____, situated in the County of _____, State of _____.

The words "Park Superintendent" or "Superintendent" shall mean the Park Superintendent of the City of _____.[3]

The words "public streets" or "streets" shall include all roads, streets, avenues, boulevards, alleys, parkways, and public rights of way, or any portion thereof, of the City.

The word "owner" shall include the legal owner of real property fronting on any street of the City, and any lessee of such owner.

SECTION 3. Number. Wherever used in this ordinance the singular number includes the plural and the plural includes the singular.

SECTION 4. Enforcing Authority. The Park Superintendent, or his duly authorized representative, shall be charged with the enforcement of this ordinance.

SECTION 5. Master Tree List. The Park Superintendent is hereby charged with the duty of promptly determining the types and species of trees suitable and desirable for planting and the areas in which and

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3. If the City does not have a Park Superintendent, substitute other authority throughout, as appropriate.

conditions under which such trees shall be planted in or which may overhang the public streets within the City. Such determination shall be made by the Park Superintendent who (may/shall)[4] consult with those familiar with the subject of such plantings, such as landscape architects, arborists, nurserymen and park executives. When such determination has been made the Park Superintendent shall report his findings in writing to the City Council. When approved by the City Council said report shall be known as the Master Tree List, shall be placed on file in the office of the City Clerk, and shall thereafter be the official determination of the Superintendent. Revisions or changes in said Master Tree List may be made from time to time by the Park Superintendent, in the manner described hereinabove for the development, approval and filing of the original Master Tree List.

All trees hereafter planted in or which may overhang the public streets of the City must be on the Master Tree List, unless a written permit from the Park Superintendent shall have first been obtained to plant a tree not on said list. Such permit may be granted by the Superintendent only upon his obtaining approval therefor from the City Council.

[SECTION X. Master or Official Tree Plan. All trees which are hereafter planted in rights-of-way or tree planting and maintenance easements shall conform to the Official Tree Plan of the City of _____.]

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4. Choice of words "may" or "shall" to be decided upon the basis of the horticultural training of the City official charged with administering the ordinance.

SECTION 6. The Park Superintendent shall have jurisdiction and control of the planting, setting out, location and placement of all trees in the public streets of the City, and shall likewise have supervision, direction, and control of the care, trimming, removal, relocation and replacement thereof.

SECTION 7. Prohibited Trees. Some types of trees, upon maturing, instead of becoming assets to the community, become liabilities due to structural weaknesses, disease or insect susceptibility, short life, destructive root systems, and rank growing branches requiring excessive maintenance. Due to one or more of these characteristics, it shall be unlawful to plant the following trees in or where they may overhang any public street:

	Botanical Name	Common Name
a.	_____	_____
b.	_____	_____
c.	_____	_____
d.	_____	_____

SECTION 8. Tree care, planting, removing, and replacement. It shall be unlawful and it is hereby prohibited for any person other than the Park Superintendent or his duly authorized agent or deputy to cut, trim, prune, spray, brace, plant, move, remove, or replace any tree in any public street within the City, or to cause the same to be done, unless and until a written permit so to do shall have first been obtained from the Park Superintendent. Any such permit may be declared void by the Superintendent if its terms are violated.

SECTION 9. Any person doing business as a public utility subject to the jurisdiction of the State Public Utilities Commission and any duly constituted public agency authorized to provide and providing utility service, shall be given a permit from the Superintendent, valid for one year from the date of issuance, permitting such person to trim, brace, remove or perform such other acts with respect to trees growing adjacent to the public streets of the city or which grow upon private property to the extent that they encroach upon such public streets as may be necessary to comply with the safety regulations of said Commission and as may be necessary to maintain the safe operation of its business.

SECTION 10. No person other than an owner or public utility may do any act for which a permit is required under Section 8 hereof except a person whose principal business is tree surgery, trimming or maintenance and who, in the opinion of the Park Superintendent, is qualified for such business, and who has obtained a permit to carry on such business in the City from the Park Superintendent. Permits issued pursuant to this Section may be granted for a period of one year from the date of issuance.

SECTION 11. It shall be unlawful for any person to break, injure, deface, mutilate, kill, or destroy any tree or set fire or permit any fire to burn where such fire or the heat thereof will injure any portion of any tree in any public street in the City, nor shall any person place, apply, attach, or keep attached to any such tree or to the guard or stake intended for the protection thereof any wire, rope

(other than one used to support a young or broken tree), sign, paint, or any other substance, structure, thing or device of any kind or nature whatsoever, without having first obtained a written permit from the Park Superintendent so to do.

SECTION 12. The Park Superintendent may inspect any tree adjacent to or overhanging any public street in the City to determine whether the same or any portion thereof is in such a condition as to constitute a hazard or impediment to the progress or vision of anyone traveling on such public street. Any tree or part thereof growing upon private property but overhanging or interfering with the use of any street that in the opinion of the Park Superintendent endangers the life, health, safety, or property of the public shall be declared a public nuisance. If the owner of such private property does not correct or remove such nuisance within 10 days after receipt of written notice thereof from the Park Superintendent, the Superintendent shall cause the nuisance to be corrected or removed and the cost shall be assessed to such owner.

Nothing contained herein shall be deemed to impose any liability upon the City, its officers, or employees, nor to relieve the owner of any private property from the duty to keep any tree upon his property or under his control in such a condition as to prevent it from constituting a public nuisance as hereinabove defined.

SECTION 13. Any person aggrieved by any act or determination of the Park Superintendent in the exercise of the authority herein granted shall have the right of appeal to the City Council of the City,

whose decision, after public hearing of said matter, shall be final and conclusive.

SECTION 14. Any person violating any of the provisions of this ordinance or failing to comply with them shall upon conviction thereof be punished by a fine not to exceed _____ or by imprisonment not to exceed _____ days or both such fine and imprisonment.

SECTION 15. All ordinances or parts of ordinances conflicting herewith are repealed (including Ordinance No. _____ of said City entitled: "_____").

SECTION 16. If any section, subsection, sentence, clause or phrase of this ordinance is, for any reason, held to be invalid or unconstitutional by the decision of any court or competent jurisdiction, such decision shall not affect the validity of the remaining portions of the ordinance.

SECTION 17. This ordinance shall take effect after its due passage and publication.

APPENDIX C

SAMPLE OFFICIAL TREE LIST[1]

Botanical Name	Common Name	Type	Form	Height (Feet)	Flower Color	[Continued Below]
Acer dasycarpum	Silver Maple	D	Oval Top	50-60		
Alnus rhombifolia	Sierra Alder (White Alder)	D	Pyramid	40-80		
Bauhinia purpurea (Variegata)	Orchid Tree	E	Dome	15-25	Purple	

Growth Rate	Spread	Average Minimum Temperature	Alkaline Tolerance	Parkway Width	Desirable Spacing Distance	Advantages and Disadvantages—Special Abilities
Rapid	50-60	-10°		5'-8'		Chemical Resistant
Rapid	20-40	-10°		6'-8'		
Rapid	15-20	20-20°		4'-6'		

1. La Mirada, California, Official Tree List, La Mirada, The City, 1962.

APPENDIX C (CONTINUED)

(ALTERNATIVE)

QUERCUS ILEX - Holly Oak

Evergreen - Moderate Growth

USE:	Shade, street, lawn, windbreak, erosion control.
SHAPE, SIZE:	To 40' - round head.
ROOT SYSTEM:	Deep.
SOIL REQUIREMENTS:	Adaptable, preferably deep loam.
CLIMATE:	Tolerates heat, dry air; not cold.
CARE:	Tolerates heavy pruning; remove suckers and poor branches - Fall.
PESTS AND DISEASES:	Caterpillars, mites, thrips, scale, anthracnose.
REMARKS:	Makes excellent street tree.

APPENDIX D

LOCATING TREES IN RELATION TO OTHER OBJECTS[1]

In locating street trees the following dimensions shall be observed and no trees shall be planted closer to existing installations than indicated:

Electroliers	20 Feet
Water and Gas Laterals	5 Feet
Sidewalk Corners and Driveway Aprons	7 Feet
Sewer Laterals	10 Feet
Projected Street Corners	25 Feet

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1. San Jose, California, Planting Specifications, San Jose, The City, 1962.

APPENDIX E

TRANSPLANTING AND QUALITY OF PLANTING STOCK[1]

1. Tree stock shall be well established [with four or more developed branches; comparatively straight and with sturdy trunk; and with well-developed leader] but not pot-bound. Trees shall be five (5) gallon size with a minimum height of five (5) feet measured from the soil level.
2. Planting holes shall be dug or drilled to loosen soil to a depth of thirty (30) inches. Diameter of holes shall be a minimum of twenty-four (24) inches.
3. Where excavated material is rocky or of poor growing quality, imported topsoil shall be used for backfill. Backfill soil, whether excavated or imported, must contain a minimum of one-fourth (1/4) organic matter consisting of either rotted steer manure, aged sawdust, spent mushroom compost or peat moss as well as one cupfull of complete organic commercial fertilizer. Backfill soil shall be thoroughly mixed before being placed in the planting hold.
4. Tree roots, if growing spirally or otherwise abnormally due to container limitations, shall be pulled away from the soil ball and placed in an outward and downward position in the planting hole.
5. Backfill soil, under and around the tree roots, shall be firmed during planting to prevent settling and to eliminate large air pockets. When backfilling is complete, the soil level of the root ball shall be at the same level as the surrounding soil (avoid planting too deep).
6. A suitable basin shall be constructed around each tree that will hold at least five (5) gallons of water. All trees shall be deeply and thoroughly watered immediately following planting and staking, regardless of weather conditions.
7. Each tree is to be supported by a 2" x 2" x 9' clear redwood stake set a minimum of two (2) feet in the ground. At least two (2) tree ties shall be used on each tree. Ties shall be rubber tire sections with attached wires (Grostraight ties or

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1. Planting Specifications of Sunnyvale, California.

equal). A figure 8 tie shall be made. All original nursery stakes and ties shall be removed.

APPENDIX F

MAINTENANCE[1]

TRIMMING AND REMOVAL

1. When possible all small established standard trees shall be trimmed of branches to a height of at least seven feet from the ground and the first branch not to be over nine feet from the ground. Newly planted, small trees need not have all the lower branches removed until they are well established. All large, established trees shall be trimmed to sufficient height to allow free passage of pedestrians and vehicular traffic: ten feet over sidewalks and twelve feet over all streets, and principal traffic thoroughfares sixteen feet.

2. All cuts should be made with a saw or pruner and only at the nodes or crotches. No stubs should be left. No spurs or climbing irons should be used in the trees.

3. All dead, cross and rubbing limbs should be removed.

4. All old and new wounds over one inch in diameter should be treated with a good quality tree wound dressing unless decayed.

5. All tools being used on a tree suspected to be infected with a contagious disease should be thoroughly disinfected before being used on another tree.

6. Whenever streets are to be blocked off, the public service, police and fire departments should be notified of the location and length of time the street will be blocked.

7. Suitable street and sidewalk barriers and signs should be used when trimming a tree to protect the public from danger. A flagman with a red flag should be stationed in the street whenever trees are to be trimmed over streets that are open to traffic. Red lanterns or flares should be placed on all barriers or obstructions remaining in the travel portion of the street.

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1. Standard Arboricultural Specifications and Standard of Practice of the National Shade Tree Conference, Wooster, Ohio.

8. All trees removed should be cut at least three inches below the ground and soil should be replaced and the area leveled. If the area where the tree is cut is to be paved, the tree should be cut at least six inches below the ground.

9. At least nine square feet of ground shall be maintained for each street tree and no impervious material shall be placed nearer than 24 inches to the trunk of the tree.

FERTILIZATION

1. Fertilization of public trees should follow the accepted standards. No fertilizer containing less than 20 per cent available essential elements should be used.

SPRAYING

1. Spraying should be done only for the control of specific diseases or insects with the proper materials in the necessary strength and applied at the proper time to obtain the desired control. General spraying for "insect and disease control" is to be discouraged.

2. Spray materials containing lime-sulphur should not be used near painted buildings.

3. Dormant oil spray must not be applied when the temperature is below 40 degrees F., or when it may fall below this before the spray has dried. Do not use oil sprays on hard maples, hickory, beech or walnut.

LITERATURE CITED

LITERATURE CITED

1. National Research Council, Highway Research Board, Planning and Management of Roadside Vegetation: An Analysis of Principles, (Special Report 23), Washington, National Academy of Sciences, 1956, p. 6.

2. Massachusetts Forest and Park Association, A Conservation Land Use Plan for the Town of Groton, Massachusetts, Boston, The Association, 1956, pp. 9-10.

3. Spagna, Neno, "Preserve Those Old Trees in Subdivisions," American City, Vol. 76 pt. 2, November, 1961, pp. 112-113.

4. Urban Land Institute, Community Builders Council, The Community Builders Handbook, Washington, 1960, p. 38.

5. Ibid.

6. Von Sternberg, Jule R., "The Economics of Trees", House and Home, Vol. 3, April, 1953, p. 131.

7. "Trees", House and Home, January, 1957, p. 162.

8. Personal interview with A. J. Embry, President, Embry Brothers Realty Company, Atlanta, Georgia, March 8, 1963.

9. Personal interview with E. S. Rowden, President, American Society of Appraisers, Atlanta Chapter, May 25, 1963.

10. Chase, Frederick A., The Remarkable Trees of Downtown Los Angeles, Los Angeles, Chamber of Commerce, n. d., p. 4.

11. Downtown Tree Planting Committee, Trees Bring Business to Downtown Los Angeles, Los Angeles, Chamber of Commerce, n. d., p. 3.

12. The Regional Planning Commission of Los Angeles County, California, A Guide to Parking Lot Requirements, Los Angeles, The Commission, n. d., p. 1.

13. National Research Council, Highway Research Board, Committee on Roadside Development, "The Roadside in Highway Design", By George B. Gordon, Report of Committee on Roadside Development Including Special Papers, Washington, National Academy of Sciences, December, 1947, p. 131.

14. Jaffe, Ruth, "Following the Trail of the Cat," Landscape Architecture, Vol. 49, Autumn, 1959, pp. 90-93.

15. Personal interview with Louie F. Deaton, Unit Forester, Atlanta and Fulton County Forestry District, Atlanta, Georgia, June 8, 1963.

16. Jaffe, op. cit., p. 93.

17. Tritenbach, Paul, "Creeping Treelessness Combatted by Stockton's Planting Program," Western City, April, 1956, p. 62.

18. United States Department of Agriculture, Trees: The Yearbook of Agriculture, Washington, Government Printing Office, 1949, pp. 29-30.

19. Ibid., p. 30.

20. Ibid., p. 195.

21. Muirhead, Desmond, The Trees on Your Street, Portland, Oregon, Portland General Electric Company, n. d., p. 23.

22. "Industry Builds Kitimat-First Complete Town in North America," Architectural Forum, Vol. 101, July, 1954, p. 136.

23. National Arborist Association, Inc., "Trees and Shrubs on Industrial Properties," By Earl Barnes, Jr., Report of Eleventh Annual Mid-Winter Meeting, Wooster, Ohio, The Association, January 28-30, 1962, p. 18.

24. Letter from Oliver A. Deakin, New Jersey Highway Department, January 18, 1963.

25. American Association of Highway Officials, Operating Committee on Roadside Development, A Policy on Landscape Development for the National System of Interstate and Defense Highways, Washington, The Association, 1961, pp. 13, 14.

26. National Research Council, Planning and Management of Roadside Vegetation, op. cit.

27. Tritenbach, op. cit.

28. Letter from E. C. Marriner, City Manager, Pittsburg, California, November 2, 1962.

29. International Shade Tree Conference, Western Chapter, "Sidewalk Problems and How They Are Handled," Newsletter, November, 1962, n.p.

30. Letter from C. J. Cassell, Acting Secretary, Livingston Planning Commission, Livingston, California, November 16, 1962.

31. Garrity, John R., The Development of a Master Plan for Street Tree Plantings. Unpublished Bachelor of Science Thesis, California State Polytechnic College, December, 1947, p. 2.

32. Gerling, Jacob, "A Day of Reckoning," Trees, March-April, 1959, p. 6.

33. Letter from Leonard H. Caro, Director of Public Works, Peoria, Illinois, April 10, 1963.

34. Scanlon, Edward A., "Street Trees," American City, March, 1947, pp. 66-67.

35. The City of Manhattan, Kansas, The Tree Program: City of Manhattan (Report No. 55-4), Manhattan, The City, March, 1955.

36. Tritenbach, op. cit.

37. El Paso de Robles, California, Ordinance Number 206, El Paso de Robles, The City, August, 1957, Sections 2, 3.

38. Selma, California, Ordinance Number 472, Selma, The City, November, 1954, Section 2.

39. Michigan Municipal League, Analysis of Tree Ordinances, Ann Arbor, The League, March, 1954, p. 2.

40. Escanaba, Michigan, Ordinance Number 141, Escanaba, The City, December, 1942, Section 1.

41. Letter from Howard B. Holman, Director of Parks and Recreation, Fresno, California, November 7, 1962.

42. Modesto, California, A Review of the Street Tree Program of the City of Modesto, Modesto, The City, 1961, p. 3.

43. Letter from William C. Studebaker, Street Tree Supervisor, City of San Diego, California, April 15, 1963.

44. Manhattan, Kansas, op. cit., p. 1.

45. Escanaba, op. cit., Sections 9, 12, 13.

46. New Jersey Federation of Shade Tree Commissions, Laws of New Jersey Relating to Shade Tree Commissions, New Brunswick, The

Federation, 1958, pp. 2-3.

47. Kent, Ohio, The City Code, Kent, The City, n. d., Sections 263-280.

48. Bruns, R. R., "Municipal Tree Census," American City, Vol. 75 Pt. 2, July, 1960, pp. 85-87.

49. California Roadside Council, More Attractive Communities for California, San Francisco, The Council, 1960, p. 39.

50. Modesto, California, The City Code, Modesto, The City, December, 1961, Chapter 5, Section 12-5. 08.

51. Brookline, Massachusetts, The City Code Brookline, The City, n. d., Chapter 106, Sections 1 and 2.

52. Delano, California, Ordinance Number 353, Delano, The City, July, 1959, Section 2.

53. Bruns, op. cit.

54. Modesto, Review of the Street Tree Program, op. cit., p. 5.

55. Selma, California, op. cit., Sections 2, 3, 4.

56. The Cleveland Electric Illuminating Company, The Master Street Tree Plan, Cleveland, Ohio, The Company, n. d., p. 8.

57. Escanaba, op. cit., Section 9.

58. Selma, op. cit., Section 6.

59. Letter from Amedee M. Sourdry, City Landscape Architect, Oakland, California, November 23, 1962.

60. Eureka Recreation and Park Department, List of Acceptable Contractors for Planting Downtown Trees, Eureka, California, The Department, August, 1962.

61. Oakland Park Commission, Resolution Number 1961-90, Oakland, The Commission, March 14, 1961.

62. Livingston, California, Ordinance Number 108, Livingston, The City, June, 1958, Section 9.

63. Michigan Municipal League, op. cit., p. 8.

64. Livingston, op. cit., Section 9.

65. Pittsburg, California, Ordinance Number 380, Pittsburg, The City, n. d., Section 408. 13.

66. Livingston, op. cit.

67. Merced, California, Ordinance Number 500, Merced, The City, n. d., Section 11.

68. Ibid.

69. Modesto, Review of the Street Tree Program, op. cit., p. 1.

70. "Learn the Facts—Get the Budget! Shade Tree Survey," Parks and Recreation, December, 1961, pp. 485-486.

71. Ibid.

72. New Jersey Federation of Shade Tree Commissions, op. cit., p. 4.

73. Modesto, Review of the Street Tree Program, op. cit., p. 1.

74. Letter from G. D. Chaster, Park Supervisor, Davis, California, May 2, 1963.

75. Ibid.

76. Scanlon, op. cit.

77. Fresno Parks and Forestry Division, Street Tree Policies and Procedures, Fresno, California, The Division, October, 1962, p. 2.

78. Modesto, Review of the Street Tree Program, op. cit., p. 1.

79. Fresno, op. cit.

80. Letter from J. M. Cowen, Jr., Parks and Recreation Department, Modesto, California, November 2, 1963.

81. City Planning Commission, Street Tree Committee, Street Trees for Anchorage, Anchorage, Alaska, The City, May, 1955, p. 11.

82. Letter from Colin Jackson, Superintendent of Parks, Sunnyvale, California, April 22, 1963.

83. The New Jersey Federation of Shade Tree Commissioners, Trees for New Jersey Streets, New Brunswick, The Federation, 1961, p. 9.

84. Hollister, California, Ordinance Number 237, Hollister, The City, December, 1961, Section 5.

85. Pittsburg, op. cit., Section 408.2.

86. Richmond Parks Division, Richmond's Street Tree Planting Program, Richmond, California, The City, 1954, p. 1.

87. Fresno, op. cit.

88. Letter from G. D. Chaster, op. cit.

89. California Roadside Council, op. cit., p. 39.

90. Letter from Colin Jackson, op. cit.

91. Street Shade Tree Report Committee, Street Shade Tree Report, Administrative Report Number 23, Peoria, Illinois, The City, October 28, 1957, p. 14.

92. Bruns, op. cit.

93. Letter from William Studebaker, op. cit.

94. Modesto, Review of the Street Tree Program, op. cit., p. 4.

95. Brarmann, Edward F., Jr., "Shade Tree ' Know-How' Pays Off in Englewood," New Jersey Municipalities, Vol. 37, Number 5, May, 1960, p. 5.

96. Modesto, Review of the Street Tree Program, op. cit., p. 3.

97. Letter from Leslie I. Rieger, Assistant City Manager, Manhattan, Kansas, April 10, 1963.

98. Brarmann, op. cit.

99. Letter from Studebaker, op. cit.

100. "Learn the Facts," op. cit., p. 486.

101. Fresno County, California, Ordinance Number 483, Fresno, The County, November, 1954.

102. Letter from J. D. La Bonte, Commercial Representative, Pacific Gas and Electric Company, Fresno, California, January 22, 1963.

103. Bennett, J. M., "Roadside Development in Wayne County, Michigan," Arborist's News, August, 1940, pp. 58-60.

104. Contra Costa County, California, Parks and Public Works Department Policy Manual, Contra Costa County, The Department, n. d., p. 250. 1.

105. California Roadside Council, op. cit., p. 45.

106. Letter from J. C. Womack, State Highway Engineer, State of California Department of Public Works, Sacramento, November 16, 1962.

107. Letter from Robert H. Bennett, Highway Construction Engineer, State Highway Department of Georgia, Atlanta, January 3, 1963.

108. Ohio State University, Department of Landscape Architecture and Ohio Department of Highways, Nineteenth Short Course on Roadside Development, Columbus, The Department, October 4-7, 1960, p. 107.

109. Ibid., p. 121.

110. Snyder, Rachel, "Trees," Flower and Garden, December, 1962, pp. 18-19, 37.

111. Letter from Brian Fewer, Supervisor of Street Planting, Department of Public Works, City and County of San Francisco, California, December 14, 1962.

112. Massachusetts Forest and Park Association, op. cit., p. 8.

113. Chadwick, J. H., "Municipal Tree Programs," The Maine Townsman, Vol. 22, Number 3, March, 1960, pp. 6-7, 25.

114. Petaluma, California, Ordinance Number 528, Petaluma, The City, September, 1958, Section 26. 5.

115. Dos Palos, California, Ordinance Number 95, Dos Palos, The City, June, 1959, Section 5.

116. Wichita, Kansas, Ordinance Number 25-972, Wichita, The City, August, 1961, Section 18.

117. Ibid., Section 19.

118. Michigan Municipal League, op. cit., p. 9.

119. Ibid.

120. Ibid.

121. Wichita, op. cit., Section 2.

122. Michigan Municipal League, op. cit., p. 9.

123. Ayers V. Los Angeles, 34 Cal. 2d 31.

124. Atlanta, Georgia, An Ordinance: Regulating the Subdivision of Land in the City of Atlanta, Georgia. Atlanta, The City, November 19, 1958, Article 4, p. 10.

125. Cordele, Georgia, The Subdivision Regulations for the City of Cordele, Georgia. Cordele, The City, January 10, 1961, Section 2, p. 3.

126. Letter from Ellis L. Kindig, Park Superintendent, City of Riverside, California, December 26, 1962.

127. Letter from K. Sei, Senior City Planner, Department of City Planning, City of Los Angeles, California, November 14, 1962.

128. Ibid.

129. Letter from R. C. Robertson, Department of City Planning, City of Glendale, California, April 17, 1963.

130. Saratoga, California, Ordinance NS-5 of the City of Saratoga, California. Saratoga, The City, June, 1962, Section 3. 8.

131. Letter from Colin Jackson, op. cit.

132. Letter from G. D. Chaster, op. cit.

133. Hemet, California, Ordinance Number 314 of the City of Hemet, California. Hemet, The City, April, 1956, Section 16.6.

134. Redwood City, California, Ordinance Number 631 of the City of Redwood City, California. Redwood City, The City, November, 1949, Section 5. 16.

135. Letter from R. C. Robertson, op. cit.

136. California Roadside Council, op. cit., p. 40.

137. Letter from R. C. Robertson, op. cit.

138. Letter from G. D. Chaster, op. cit.

139. Hollister, California, Ordinance Number 212 of the City of Hollister, California. Hollister, The City, January, 1960, Section 7. 14.

140. Letter from G. D. Chaster, op. cit.

141. Redwood City, California, op. cit., Section 5. 16.

142. Letter from K. Sei, op. cit.

143. Saratoga, op. cit., Table 3, pp. 39-40.

144. Pacific Grove, California, The City Code, Pacific Grove, The City, June, 1959, Section 10-503.

145. Ibid.

146. Letter from Murl M. Fritschle, City Manager, City of Pacific Grove, April 18, 1963.

147. Detroit, Michigan, "Zoning-Development of Parking Lots and P-1 Districts," Ordinance Number 564-E, Detroit, The City, June 1, 1951.

148. Letter from Paul A. Shaffer, Planning Director, City of Pasadena, California, November 6, 1962.

149. Letter from Colin Jackson, op. cit.

150. Monterey, California, Ordinance Number 528 of the City of Monterey, California. Monterey, The City, May, 1962. Section 8. 6.

151. Personal interview with James J. Hamby, Area Site Planner, Federal Housing Administration, Atlanta, Georgia, May 20, 1963.

152. Wichita, Kansas, Subdivision Rules and Recommendations for the Wichita Area, Wichita, The City, September, 1953, Page 17.

153. Westlake Subdivisions Improvement Association, By-Laws of Westlake Subdivisions Improvement Association, Daly City, California, The Association, November, 1955, Part 2, Section 10.